

but none is now produced. The only mine still working is one in Glamorganshire, which produces iron ore (haematite). Yet, at one time or another in the past, gold, silver, copper, lead, zinc, iron and manganese ores were extracted in considerable quantities; and for a year or two there was even a small output of cobalt oxide. Indeed, the famous Parys Mountain mine in Anglesey is said to have been the largest producer of copper in Europe in the mid-eighteenth century; and the history of the mining of argentiferous lead ore goes back to Roman times. With the passage of time, mining techniques, too, have changed considerably, and Dr. North has something to say on this aspect of his subject. He has, in fact, condensed a very great deal of information drawn from many sources, often not easily accessible, into a short but very readable book with a number of attractive illustrations. The bibliography, which lists 164 references, is particularly valuable. Although the book has been produced by the National Museum of Wales primarily as a museum guide, for its newly established Department of Industries, it is, nevertheless, an important, authoritative, and much-needed contribution to the history of mining in Great Britain.

In 1915 a decision was made in the United States to prepare a completely new, enlarged and thoroughly revised (seventh) edition of Dana's classic *System of Mineralogy*. This was a major undertaking on which work has been proceeding ever since. Volume 1 of this edition, covering the elements, sulphides, sulpho-salts and oxides, was published in 1944; and Volume 2, which included the halides, carbonates, phosphates and other salts, in 1951. Volume 3, on the silica minerals, is the latest to appear. It has been written by Prof. C. Frondel of Harvard, who was a co-editor of the earlier volumes. It describes the properties and modes of occurrence of all the known polymorphs of silica, not only specific forms such as quartz, tridymite, cristobalite and more recently discovered species such as coesite and stishovite, but also the less well-defined varieties such as chalcedony, agate, opal, jasper, flint and so on. The text is well illustrated by line and half-tone illustrations and, as in earlier editions, much interesting historical matter has been included. This latest addition to the new 'Dana' will doubtless be welcomed by students and research workers in mineralogy and geology and by crystallographers and mineral technologists. Two further volumes are stated to be in the course of preparation, to complete the work. These will deal exclusively with the silicate minerals.

*Volcanoes and their Activity* is a translation of the second, revised and enlarged edition of Prof. A. Rittmann's *Vulkane und ihre Tätigkeit* (1960), which has been made by Prof. E. A. Vincent, now professor of geology at the University of Manchester. The book covers a wide field. The earlier chapters discuss volcanic activity in general, the products of volcanoes, and their structure and geographical distribution. In succeeding chapters the author discusses the physicochemical properties of magmas, the nature of magma chambers, and the mechanism of volcanic eruptions. In the last two chapters he elaborates a geological theory embracing vulcanicity, mountain building, magmatism, the Earth's interior, and the origin and development of the Earth. The theoretical views put forward in the latter part of the book are personal to the author and, admittedly, controversial. For this reason he states that his book should not be regarded as a text-book. Prof. Rittmann is, however, generally acknowledged as an authority on his subject. His book summarizes the results of many years of observation in the field; and it is on this work that his theoretical conclusions are based. His book, therefore, should be welcomed by all students of igneous geology, and volcanology in particular, especially because there is no equivalent book in the English language. The numerous figures illustrating the text add to its interest, many being reproductions from actual photographs of volcanoes and their products.

The second edition of Longwell and Flint's *Introduction to Physical Geology* is a thoroughly revised, enlarged, and largely re-written version of the original edition of 1955. A feature of this elementary text-book is its richness in line and half-tone illustrations drawn from many sources, including air photographs. Their number has been substantially increased, thereby adding to the value of the book for teaching purposes. Other changes include the introduction into the text of definitions of geological terms whenever they are first used, rather than in a separate glossary; and the addition of a brief summary of contents at the end of each chapter. The book should succeed very well in its main object; but the series of appendixes on the identification of common rocks and minerals, and on the properties of the latter, and on the use of maps and map symbols, are so short that their value is questionable.

## ULTRA-PURIFICATION OF SEMI-CONDUCTOR MATERIALS

### Ultrapurification of Semiconductor Materials :

Proceedings of the Conference, Boston, Massachusetts, April 11-13, 1961. Edited by M. S. Brooks and J. K. Kennedy. Pp. 655. (New York and London: The Macmillan Company New York, a Division of The Crowell-Collier Publishing Company, 1962.) 12.50 dollars; 94s.

THIS volume is a report of the Boston conference held in April 1961 and contains forty-nine papers. The title is perhaps a little misleading, in that many of the materials considered are not themselves semiconductors, but are used in the preparation of semiconductors or semiconductor devices. The papers are divided into three groups dealing with chemical preparation and purification analysis, and the physical methods of preparation. The first group of papers contains information on the purification of silicon, boron, bismuth, tellurium, gallium, rare earths, indium, antimony, and arsenic. It begins with an excellent review paper by Fuller of Bell Telephone Laboratories detailing progress so far on the purification of elements and compounds. The paper also discusses analytical methods for trace impurities and contains a most useful bibliography of fifty-one papers. The first three papers of the group deal with the purification of silicon from silicon tetraiodide and silicon hydride. The fourth paper deals with the preparation of boron from boron trichloride. A paper on organometallic compounds in the preparation of high purity metals is very complete and has 151 references. The last two papers in the section deal with chromatographic methods for purification, the starting point being organometallic compounds.

The second group of papers starts with a review by G. H. Morrison dealing with activation analysis, emission spectroscopy, and mass spectra. In this section there are eight papers dealing with emission and mass spectroscopy to detect impurities in elements and compounds, mainly of the III/V class. One is left with the impression that when materials are pure enough to be interesting as semiconductors these analytical techniques are already stretched to limit of sensitivity.

The third group of papers, which deals with physical methods of preparation, starts with a section on zone-purification processes, mainly from the point of view of the physics of the zone-refining process. The second section, on crystal growing, deals mainly with silicon and III/V compounds, while the final part contains miscellaneous papers mostly concerned with semiconductor materials.

This book will be most useful to the physicist or chemist working in the field of material preparation, both semiconductor and other related materials. The bibliographies attached to many papers are in themselves most valuable.

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